

meetings of advantageously varied couples, from age to age, are to provide the pedigree of modifications which unite us to our ancestors, the jelly-fish."

Here we have the extraordinary misconception presented to a scientific audience as actual fact, that advantageous variations occur singly, at long intervals, and remote from each other, each statement being, as is well known, the absolute reverse of what is really the case. It totally ignores the fact that every abundant species consists of tens or hundreds of millions of individuals, and that as regards any faculty or quality whatever, this vast host may be divided into two portions—the *less* and the *more* adapted—not very unequal in amount. It follows that at any given time, in any given country, the advantageous variations always present are not to be counted by ones and twos, as stated by Lord Salisbury, but by scores of millions; and not in individuals widely apart from each other, but constituting in every locality or country somewhere about one-half of the whole population of the species.

The facts of nature being what they are, it is impossible to imagine any slow change of environment to which the more populous species would not become automatically adjusted under the laws of multiplication, variation, and survival of the fittest. Almost every objection that has been made to Darwinism assumes conditions of nature very unlike those which actually exist, and which must, under the same general laws of life, always have existed.

Protective Colour and Mimicry.

The phenomena of protective coloration and mimicry were very briefly alluded to both because they are comparatively well known and had formed the subject of previous lectures, while they are very easily explained on the general principles now set forth. The explanation is the more easy and complete, because of all the characters of living organisms, colour is that which varies most, is most distinctive of the different species, and is almost universally utilised for concealment, for warning, or for recognition; and, further, its useful results are clear and unmistakable, and have never been attempted to be accounted for in detail by any other theory than that of the continuous selection of beneficial variations.

The Dispersal of Seeds.

The subject of the dispersal of seeds through the agency of the wind, or of carriage by birds or mammals in a variety of ways, and often by most curious and varied arrangements of hooks, spines, or sticky exudations almost infinitely varied in the different species, was also briefly treated, since they are all readily explicable by the laws of variation and selection, while no other rational explanation of their formation has ever been given.

Conclusion.

In concluding, the lecturer directed attention to a series of cases which had shown us the actual working of natural selection at the present time. He also explained that these cases were at present few in number, first, because they had not been searched for, but perhaps mainly because they only occur on a large scale at rather long intervals, when some great and rather rapid modification of the environment is taking place.

In the following paragraph he endeavoured to summarise the entire problem and its solution:—"It is only by continually keeping in our minds all the facts of nature which I have endeavoured, however imperfectly, to set before you, that we can possibly realise and comprehend the great problems presented by the 'World of Life'—its persistence in ever-changing but unchecked development throughout the geological ages, the exact adaptations of every species to its actual environment both inorganic and organic, and the exquisite forms of beauty and harmony in flower and fruit, in mammal and bird, in mollusc and in the infinitude of the insect-tribes; all of which have been brought into existence through the unknown but supremely marvellous powers of Life, in strict relation to that great law of Usefulness, which constitutes the fundamental principle of Darwinism."

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LONG-DISTANCE TELEGRAPHY.

THE developments which have recently taken place in long-distance direct telegraphic working show that progress has been made in telegraphic transmission by wire as well as in wireless telegraphy. The direct transmission of public messages between London and India was put into operation last week, and messages were sent at the rate of forty words per minute between London and Karachi. Direct working with Calcutta, Bombay, and Madras has been successfully established, the experiment of direct transmission to the first-named centre being attempted for the first time last Saturday, when a world's record was established of about 7000 miles.

Direct Wheatstone working over the line between London and Teheran—a distance of 3748 miles—has been possible since the beginning of 1903, but no land line existed between Teheran and Karachi. This line has been recently erected by the Indo-European Department of the India Office, and was put into operation in November, 1907, bringing the total length of line—London to Karachi—up to 5532 miles. Wheatstone automatic transmission is used throughout the line, and many improvements in telegraphic instruments which have been introduced in recent years have been installed. One of the latest key-board perforators is the Kotyra, which is so arranged that the key-board is made to actuate three electromagnets so constructed that the necessary number of blows are communicated to the keys of a Wheatstone perforator. At each relay station a receiving apparatus is placed in circuit enabling the operator in charge to see how the signals are leaving that station, and any fault in regulation can be at once rectified.

The great advantage of being able to transmit direct messages over such distances is that, apart from the time saved and the consequent increase in the capacity of the line, greater accuracy is ensured owing to the fact that no intermediate handling takes place. Thus liability to error is reduced to a minimum. The importance of this will be understood when it is realised that 1600 messages per diem—97 per cent. of which are in code—are sent on the average over this line. The Indo-European Telegraph Company and the Telegraphic Department of the India Office have, with the cooperation of the Indian Government, achieved a great success, considering the enormous difficulties attendant upon a land line traversing every variety of country and exposed to all sorts of climatic conditions.

J. L. M.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Mr. H. F. Newall, F.R.S., has been elected a fellow of Trinity College. Mr. Newall has been engaged for many years in astrophysical research at the observatory, in connection with a large Equatorial presented to the University by his father. He was formerly an assistant to the Cavendish professor of physics, and demonstrator in the Cavendish Laboratory. He is at present assistant director of the Observatory, treasurer of the Cambridge Philosophical Society, and president of the Royal Astronomical Society. Mr. Newall, by his continuous generosity, has firmly established the study of astrophysics in the University, and to him the University owes a considerable debt of gratitude.

LONDON.—A course of eight lectures on national eugenics, in connection with the Galton Laboratory, will be given at University College on Tuesdays at 5 o'clock, beginning on February 23. The first lecture will be given by Prof. Karl Pearson, on "The Purport of the Science of Eugenics." On the four following Tuesdays the lectures will be given by Mr. D. Heron, and will deal with the following subjects:—methods of eugenic inquiry; transmission of physical characters in man; transmission of psychical characters in man; inheritance of disease and deformity. The course will be continued in the third term, beginning on May 4, when Miss E. Elderton will lecture on "Effects of Kinship in Marriage" and "Comparison of Heredity and Environmental Factors." Full par-

ticulars of the lectures can be obtained from the secretary of University College.

THE annual prize distribution and conversazione of the Northampton Polytechnic Institute, Clerkenwell, E.C., will be held on Friday and Saturday, February 5 and 6. The Earl of Halsbury, P.C., will distribute the prizes on February 5, and after the prize distribution the new buildings, which have been recently erected in the courtyard with funds provided by the London County Council, will be formally declared open. After the above ceremonies the whole of the laboratories, workshops, drawing offices, and studios of the institute will be on view in working order.

THE second international course for legal psychology and psychiatry will be held at Giessen (Grandduchy of Hesse), Germany, on April 13—18. The course will be under the direction of Prof. Sommer, with the cooperation of Profs. Mittermaier and Dannemann, of Giessen, and Prof. Aschaffenburg, of Cologne. All communications should be addressed to Dr. Sommer, professor of psychiatry, University of Giessen.

AN article by Prof. Fleming in *Engineering* for January 8 directs attention to the need for a revision of the syllabus for the B.Sc. degree in engineering at London University. It is contended that the syllabus now in force enables a candidate to obtain the degree without having undergone a systematic training in civil, mechanical, or electrical engineering, owing to the freedom of choice allowed, especially in the second or "B" group of subjects. The experience of several years has shown that a large number of candidates exercise their freedom of choice by taking the path of least resistance, and they do not, as a rule, select subjects which form complete and well-arranged courses of study. Subjects of minor importance have, to the majority of candidates, a wide popularity for examination purposes, and Prof. Fleming suggests that if university degrees are to possess, or to continue to possess, any importance in the engineering world, the courses of study must be framed solely with a view to equip students for their work in after life, and not for the immediate purpose of passing an examination.

WE have received a copy of the second series of papers published by the Department of Education of the Armstrong College, Newcastle-upon-Tyne. The special feature of the pamphlet is a very full account of an experiment of a novel character in training-college practice. As Prof. Mark R. Wright, the head of the department, points out, in ordinary school work there is a tendency for the relations between teachers and taught to become formal and artificial, and the motive of the experiment described in these pages was to determine how far a training-college camp could be made to obviate such tendency and to import humanising influences and greater cordiality into the work of education. Outdoor life and the study of nature under skilled guidance were among the distinguishing characteristics of the fortnight's life under canvas, and the results of the experiment appear to have been gratifying. The experiment is, we understand, to be repeated annually, and we hope it may be imitated by other training-college authorities. There can be no doubt that intelligent, well-planned experiments, followed by an impartial and correct account of the results obtained, will contribute more than any other expedient to the development and formulation of a science of education. These "papers" may be commended to the attention of students of educational problems.

THE report on the operations of the University of the Punjab for the year ending September 30, 1908, emphasises the contention, says the *Pioneer Mail*, that in Indian universities the arts side, which comprises exclusively literary courses, is patronised to the neglect of the scientific side of education. In the Punjab University there is no faculty either of engineering or of commerce. There is a faculty of science, but its examinations, compared with those of the faculty of arts, do not attract many candidates. Referring to the examinations of the two faculties held in 1908, it is pointed out by our contemporary that in the matriculation examination, whilst in the arts faculty there were 3408 candidates, of whom 1470 were successful, in the science faculty there were only 72, of whom 36 were successful. In the intermediate examination, whilst 697,

of whom 308 were successful, appeared on the arts side, the number of those who appeared on the science side did not exceed 39, and of these 18 were successful. Whilst 315 appeared for the degree of Bachelor of Arts and 116 were successful, a much smaller number, of whom 5 were successful, competed for the degree of Bachelor of Science. As regards the master's degree in the two faculties, whilst 42 competed on the arts side, there were only 4 on the science side. The results on the science side were, however, better than those on the arts side.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, Received November 3, 1908.—"Reciprocal Innervation of Antagonistic Muscles. Thirteenth Note. The Antagonism between Reflex Inhibition and Reflex Excitation." By Prof. C. S. **Sherrington**, F.R.S.

In this paper the question is raised as to how reflex excitation and reflex inhibition are related one to another in their action on a reflex centre common to both of them. In the case of such antagonisms as the action of the vagus and accelerans on the heart and that of the vasodilator and vasoconstrictor nerves on a vascular area, and that of depressor and excitatory asphyxial influences on the vasomotor centre, several observers have shown that the antagonism is a pseudo-antagonism rather than a real antagonism—that is, the one action interferes with the other by delaying it, but does not directly annul it or really abolish or counterbalance it.

The present paper brings experimental evidence that in reflex inhibition and reflex excitation playing upon a common centre we have two influences which are really in the strict sense antagonistic in that they behave one to another as two forces which act in opposite direction at the same point of application. The result is an algebraic summation of the effects obtainable from the two nerves—the excitatory afferent and the inhibitory afferent—singly. The individual effects of the two nerves fuse to a resultant. The two opposed nerves must have in the reflex centre a common locus of operation. There the antagonistic influences collide. This point of collision may lie at a synapse, in which case the opposed influences may be thought of as altering oppositely the permeability of the synaptic membrane. Or it may lie in the substance of a neurone, if so, probably in the motoneurone itself, and in that part of it which lies within the reflex centre. In either case the net change which results when the inhibitory and excitatory afferents are concurrently stimulated is an algebraic sum of the *plus* and *minus* effects producible by the two antagonistic nerves singly. Tracings illustrate the experimental results.

November 19, 1908.—"Measurement of Rotatory Dispersive Power in the Visible and Ultra-violet Regions of the Spectrum." By Dr. T. Martin **Lowry**.

In order to measure rotatory dispersive power in the visible region of the spectrum, the light from an arc formed between a pair of rotating metallic electrodes is concentrated by a lens on the widely opened slit of a constant-deviation spectroscope. An achromatic lens of 22-inch focus (displacing the telescope of the instrument) casts a magnified image of the slit on the polarising prisms of a triple-field polarimeter. The colour of the image can be varied by rotating the prism of the spectroscope; its maximum width for monochromatic illumination is determined by the openness of the spectrum and the efficiency of the dispersive system. Of the twenty-six wave-lengths employed, those shown in heavy type can be read with the full width of the aperture, the remainder as bands occupying one-third of its width; the yellow mercury doublet can be read as a single band or as two narrow separate lines:—

Li ...	6708	...	Na ...	5893	...	Tl ...	5351	(flame spectra)
Hg ...	5790	...	5769	...	5461	...	4359	...
Cd ...	6438	...	5086	...	4800	...	4678	...
Cu ...	5782	...	5700	...	5219	...	5154	...
		...	4705	...	4651	...	4587	...
Zn ...	6364	...	4811	...	4722	...	4680	...
Ag ...	5469	...	5209